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Final Report

**Exploration of New Technologies and Novel Designs
to Improve X-ray Framing Camera Performance**

Principal Investigator:

R. Paul Drake,
University of Michigan

November 1, 2002

Final Report

Under funding by this contract, we have accomplished the following.

We have developed and activated a facility for steady-state x-ray characterization of microchannel plates, framing cameras, and related components. We have completed a vacuum system with a Manson-type x-ray source. This required experience with and upgrading of the source in order to make it routinely operable. At this time we are able to operate it routinely and we have written manuals for its operation and maintenance by students working in our laboratory environment. The system includes an absolutely calibrated vacuum photodiode for x-ray flux measurements. Figure 1 shows an image of the source, attached to the vacuum chamber.

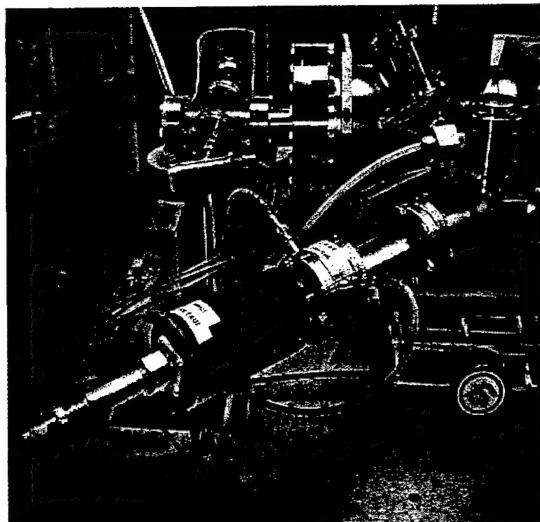


Figure 1. The x-ray source.

We have activated a micro-channel-plate mounting system, so that we can work with 2 inch microchannel plates, backed by a fiber optic faceplate with a phosphor coating. This produces data as shown in Figure 2, obtained by recording the emission from the phosphor with a lens-coupled CCD system. This can be seen in figure 3. The x-ray spot, in the present system, does not fill the 2-inch plate, but this is not necessary for the intended studies of efficiency and noise. We have designed and are now implementing an adapter to our mount, to allow us to work with 1-inch microchannel plates.

We have begun using this system to characterize a number of plates we purchased having a variety of bias angles and coatings. We have also worked on calculating the variation with bias angle in the behavior of channel plates

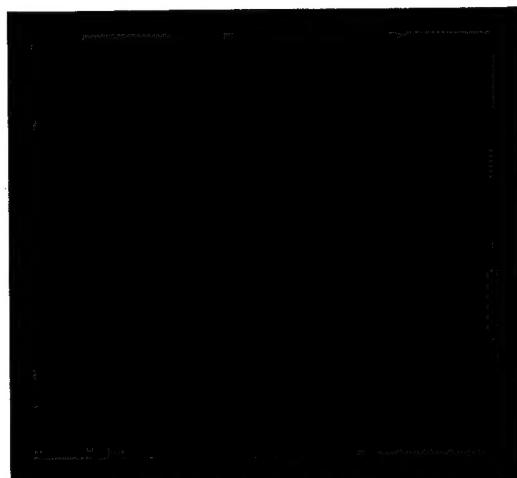


Figure 2. Signal from x-ray source through channel plate and phosphor.

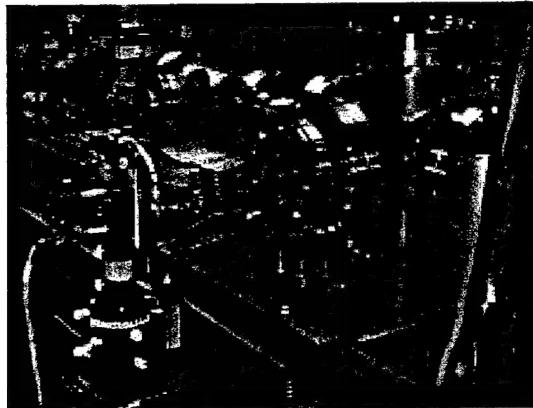


Figure 3. The lens-coupled CCD system, the phosphor, and the vacuum chamber are visible in this photograph.

used to for imaging, as opposed to pulse counting, which is treated in the literature.

In the process of getting to this point, we have assembled or purchased a number of other facilities including a hood under which to work on these systems, a nitrogen dry box for storage, and a nitrogen system for venting from vacuum.

We also accomplished a number of related activities. We did some preliminary work with a multiple-diode system that can be used to evaluate various potential photocathode materials. We obtained schematics and did some planning associated with pulsing of the x-ray source. We did extensive literature searching related to photoelectric quantum efficiency and the effect of electric fields on this. In addition, we sent two students to NRL to work with NRL researchers on x-ray facilities and diagnostics at NRL.

We are presenting the results of our work to date at the APS/DPP meeting in November of 2002.

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